Turbulence and transport in fusion plasma

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Turbulent transport is the dominating mechanism for plasma transport across a confining magnetic field in hot plasmas. This transport is usually referred to as anomalous transport in contrast to normal (classical/neo-classical) transport mediated by collisions. It is the limiting factor for plasma confinement in fusion plasma experiments and an important mechanism for mixing and transport in space plasmas. The turbulent fluctuations arise spontaneously due to pressure gradients perpendicular to the magnetic field. Low frequency plasma turbulence is well described by the fluid model for plasma dynamics, and it is essentially quasi two-dimensional, i.e., the turbulence is strongly anisotropic with the main dynamics in the plane perpendicular to the magnetic field. In this talk I will at introduce the specific features of plasma turbulence and the associated transport/mixing. As a specific example I will discuss turbulence in the boundary region (edge plasma) and scrape-off layer (SOL) region of magnetically confined plasmas, where the relative fluctuation levels in, e.g., the plasma density approach unity.